

CLAIMS

What is claimed is:

1. A method of forming a SIMS monitor device for determining a doping profile of a semiconductor device structure comprising the steps of:

providing a plurality of regularly repeating semiconductor structures including a doping profile to form a monitor device including at least one layer of the regularly repeating semiconductor structures;

planarizing the monitor device through a thickness of the regularly repeating semiconductor structures to reveal a target surface overlying the doping profile to form a monitor pattern; and,

sputtering the target surface over a sputtering area including the monitor pattern through a thickness thereof while simultaneously detecting and counting over a time interval at least one type of species ejected from the target surface according to a secondary ion mass spectroscopy procedure (SIMS).

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2. The method of claim 1, wherein the monitor pattern further comprises a regularly repeating pattern in at least two dimensions.

3. The method of claim 1, wherein the planarizing step further comprises a chemical mechanical polishing (CMP) step.

4. The method of claim 3, wherein the target surface comprises a polysilicon substrate including the doping profile.

5. The method according to claim 1, wherein the monitor device further comprises multiple layers of the regularly repeating semiconductor structures.

6. The method of claim 4, wherein the steps of planarizing and sputtering are carried out for at least one layer of the multiple layers.

7. The method of claim 1, further comprising the step of determining the doping profile.

8. The method of claim 1, wherein the target surface has an area sufficient to include the sputtering area.

9. The method of claim 1, wherein the regularly repeating semiconductor structures include CMOS structures and memory structures.

10. The method of claim 1, wherein the monitor pattern forms regularly repeating rows.

11. The method of claim 1, wherein the monitor pattern forms regularly repeating rows of regularly repeating rectangles.

12. A monitor device for analysis of a doping profile of an individual semiconductor device structure according to a SIMS procedure comprising:

a planar surface intersecting a plurality of regularly repeating semiconductor structures including a doping profile to form a target surface said regularly repeating semiconductor structures included in at least one layer of the monitor device

said monitor device being mountable in a secondary ion mass spectrometer for sputtering the target surface through a thickness to determine the doping profile.

13. The monitor device of claim 12, wherein the target surface further comprises a regularly repeating pattern in two dimensions formed by the planar surface intersecting a plurality of regularly repeating semiconductor structures.

14. The monitor device of claim 12, wherein the target surface is disposed at about the start of the doping profile extending through a thickness perpendicular to the target surface.

15. The monitor device of claim 12, wherein the monitor device further comprises multiple layers of the regularly repeating semiconductor structures.

16. The monitor device of claim 12, wherein the target surface includes a sputtering area.

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17. The monitor device of claim 15, wherein the target surface forms a rectangular shape with a length of about 50 microns to about 300 microns on a side.

18. The method of claim 12, wherein the regularly repeating semiconductor structures include CMOS structures and memory structures.

19. The monitor device of claim 13, wherein the regularly repeating pattern approximates regularly repeating rows.

20. The monitor device of claim 13, wherein the regularly repeating pattern approximates regularly repeating rows of rectangular shapes.